REMARKS

The Office Action dated 12/23/03 has been fully considered by the Applicant. Claims 1, 10-15 are currently amended; claims 2-9 have been previously amended; claims 16-21 are new. Enclosed is a check for $344 to cover the cost of additional independent claims.

Claims 1-8 have been rejected under 35 USC 102(b) as being anticipated by FR 1,582,851. Reconsideration of the rejection is requested.

Claim 1 as currently amended includes as a part thereof a second chamber being isolated in fluid communication from said control chamber and from the pressure reducing valve being controlled, and that the control pressure is different from the outlet pressure of the pressure reducing valve being controlled.

The FR 1,582,851 patents teaches away from a second chamber being isolated in fluid communication from the control chamber, but instead teaches toward a device (Figs. 1 and 4) having a direct fluid communication between downstream pipe 3 of the pressure reducing valve 8 and the second chamber above the second chamber diaphragm S_1 (see Fig. 1, where the downstream pipe and second chamber are both labelled 3). Furthermore, the FR 1,582,851 device has fluid communication between the second chamber and the control chamber 111, via the intermediate chamber 6 (see Fig. 1). Without this latter connection, the pressure in the control chamber 111 and intermediate chamber 6, "P" of the FR 1,582,851 patent, would eventually equal the pressure in 5, as it would have nowhere to go.

Claim 1 has been further amended to include the control pressure being different from the outlet pressure of the pressure reducing valve being controlled. This is exactly the opposite of the teachings of the French Patent 1,582,851, which teaches that the pressure (p) is exactly the same

as the outlet pressure of the main valve (3), since main valve (3) is in direct fluid communication with the top of the second chamber diaphragram S_1. How could Applicant's pilot valve having a second chamber which is isolated from fluid communication with the control chamber and with the pressure reducing valve being controlled function within the closed system of the FR 1,582,851 patent which has valve 3 being in direct fluid communication with the top of the second chamber diaphragm? In addition, it is precisely Applicant's open system which provides for the difference of pressure between the outlet pressure of the pressure reducing valve and the control pressure. Clearly, Applicant's currently amended claim 1 is novel over the French Patent 1,582,851, and reconsideration of the rejectionof claims 1-8 is respectfully requested.

In addition, the examiner states that FR 1,582,851 discloses a pilot valve (4) for controlling a pressure reducing valve (8).

However, claim 1 is directed to a pilot valve for use in controlling a pressure reducing valve of a *water* supply system, said valve comprising biasing means to control a gate for controlling *water flow* through a control chamber, etc.

FR 1,582,851 does not disclose such a valve, because the *gas* regulator system shown in Figures 1 and 4 of this document is not suitable for controlling a pressure reducing valve of a water supply system, and control chamber 111 could not have water flowing through it since, main water valves are not controllable by a pilot valve arrangement as shown in Fig. 1 of FR 1,582,851. This would lead to a very unstable control of the outlet pressure 3. Fig. 1 of FR 1,582,851 shows the operation of a *gas* regulator. In addition, because water is incompressible, water valves are controlled by a pressure being applied to the main valve which is derived from a pilot rail which comprises a restriction and a pilot, the opening of which smoothly controls the amount of headloss

through the restriction, unlike the arrangement of FR 1,582,851. Fig. 1 of the present application illustrates this classic arrangement for water pressure reducing valves.

Keep in mind that it is not acceptable practise to have an O-ring (or similar) seal on a pressure reducing valve for a water supply system (for the reasons explained on page 5, lines 6 to 12 of the present application). Fig. 1 of FR 1,582,851 shows that chamber 6 requires such a seal (see below). Therefore, the intermediate chamber 6 and control chamber 111 (to which 6 is connected), could not have water flowing through them.

In order to open the main valve 8 of the system of FR 1,582,851 (Figs. 1 and 4), control pressure in chamber 111 enters intermediate chamber 6 and pushes against principal membrane 7. This lifts a mechanical linkage to the main valve (shown by a line in Fig. 1) which pulls open the main valve. This mechanical linkage passes through the bottom of chamber 6 to the valve 8, and hence requires an "O-ring" seal around it, to prevent fluid connection between chamber 6 and the downstream pipe 3. This is unacceptable in a water pressure reducing valve system.

The Examiner states that the recitation of water is reflective of intended use. If so, it is clear from FR 1,582,851, and for the reasons outlined above, that the gas pilot valve shown in Figs. 1 and 4 of this document could not possibly have this intended use. Therefore, FR 1,582,851 does <u>not</u> disclose a pilot valve for use in controlling a pressure reducing valve of a *water* supply system, said valve comprising biasing means to control a gate for controlling *water flow* through a control chamber. Therefore, claims 1 to 8 are novel over FR 1,582,851.

The examiner further states that Fig. 1 of FR 1,582,851 shows that the pressure at the outlet (of control chamber 111) is substantially equal to the outlet pressure (3) of the pressure reducing valve (8). However, this is not the case because the control chamber 111 in Figs. 1 and 4 of FR

1,582,851 has a control pressure "P". This is internally generated, as an *intermediate* pressure between inlet 5 and outlet 3. Outlet 3 of the main valve has a *different* pressure, "p", which is acting directly on the small diaphragm S_1 (since the main outlet is in direct fluid communication with the top of this diaphragm). Therefore, in FR 1,582,851, the water pressure at the outlet (P) is not the same as the water pressure at the outlet pressure (p) of the main pressure reducing valve.

Claim 9 has been rejected under 35 USC 103(a) as being unpatentable over FR 1,582,851. The Examiner states that it would have been obvious to choose the ratio of the area of the control chamber diagram to the second chamber diaphragm to be 2:1 or less, in order to adjust the sensitivity of the pressure P (in chamber 111) to the changes in the downstream pressure p. Reconsideration of the rejection is respectfully requested.

The FR 1,582,851 patent neither teaches nor suggests the advantag of Applicant's presently claimed invention wherein the control pressure p is from an independent source, enabling a relatively small air pressure, for example, to effect a relatively large change in water pressure. This is why ratios of 2:1 *or less*, e.g. 4:3 (see page 8, lines 12 to 17), are advantageous because they *increase* the multiplier effect. A ratio of 4:3, for example, causes the outlet pressure to decrease by *three* times the amount of the increase in control pressure. Lower ratios increase the multiplier effect, and an increased multiplier effect causes less power to be required to effect a given decrease in outlet pressure, so that energy is saved. This advantage is not applicable to the closed system arrangement described in FR 1,582,851, in which the control pressure (P) is *internally* generated in chambers 111 and 6, and the pressure which acts on the smaller diaphragm S_1 is the pressure *being* controlled (p). In such a closed system, there is no such need for a large "multiplier" effect, which could of course cause considerable internal instability. Therefore, there would be no obvious advantage of selecting

ratios of 2:1 *or less*. Indeed, FR 1,582,851 does not refer to such a range of ratios, let alone describe its advantages in a closed system.

Of course, there may be an "optimum" ratio in a closed system, which balances sensitivity of the control chamber pressure to changes in the pressure acting on it with the stability of the system. However, if so, there is no suggestion at all in FR 1,582,851 that this "optimum" ratio is 2:1. Furthermore, such an "optimum" ratio could not be 2:1 *or less*, because a ratio of "less than 2:1" indefinitely increases the "multiplier" effect and thus the instability of a closed system. Therefore, Applicant's presently claimed ranges of diaphragm area ratios of 2:1 or less, or of 4:3 or less, could not have been obvious in view of FR 1,582,851, since the FR 1,582,851 patent neither refers to these ratios nor teaches of the possible advantages of using them in a non-closed system that uses an independent control pressure. Therefore, reconsideration of the rejection of claim 9 is respectfully requested.

Claims 10-15 have been rejected under 35 USC 103(a) as being unpatentable over FR 1,582,851 and further in view of the either United States Patent No. 4,267,855 to Bradshaw, United States Patent No. 5,016,665 to Konieczynski or United States Patent No. 5,694,975 to Eidsmore. Reconsideration of the rejection is respectfully requested.

Examiner Krishnamurthy states that it would have been obvious to replace the source of control pressure in the pilot valve of Figs. 1 and 4 of FR 1,582,851 with an independent source of control pressure to enable the "utilization of greater flexibility in the range of control pressures to be applied". The teachings of Bradshaw or Konieczynski or Eidsmore cannot be applied to the pilot valve of FR 1,582,851, since in order for the device of FR 1,582,851 patent to work, it cannot have an independent control pressure source.

Applicant respectfully disagrees with the Examiner's rejection of the aforestated claims under 35 USC 103(a). Absent some suggestion or motivation supporting the combination of references, the references may not properly be combined. "The mere fact that references *can* be combined or modified does not render the resulting combination obvious unless the prior art suggests the desirability of the combination". M.P.E.P. Section 2143.01 (Emphasis in original). Further, it is necessary for the Examiner to set forth *evidence* that one of ordinary skill in the art would have been led to combine the teaching of the applied references. Accordingly, Applicant respectfully submits that claims 10-15 are allowable over the art of record.

The device of Figs 1 and 4 of FR 1,582,851 is a completely *closed* system (see page 2, lines 5 and 6, and Fig. 1) in which the control pressure must be an *internally generated* pressure, derived from the upstream pressure 5, and acting against the downstream pressure 3. This control pressure, P, is an intermediate pressure between the inlet pressure 5 and outlet pressure 3 (or "p"). It resides in control chamber 111 and intermediate chamber 6, and acts against the outlet pressure 3 on the other side of the smaller diaphragm S_1 and the principal diaphragm 7.

The "intermediate" control pressure has the effect of raising the principal valve 8 in the event of a drop in the downstream, outlet pressure 3 or "p". This drop in downstream pressure is "detected" because the intermediate pressure P acts against the downstream pressure p, or 3, via the diaphragms S_1 and 7, and opens the main valve (see Figs 1 and 4).

Clearly, the pilot valve of Figs. 1 and 4 could not work as taught in FR 1,582,851, if this intermediate control pressure P, in chamber 111, was replaced by a completely independent pressure source. If so, the control pressure would <u>not</u> be "intermediate" between the inlet pressure 5 and

downstream pressure 3, in order to open the main valve in the event of a drop in the downstream pressure. Also, of course, any relative drop in the downstream pressure would not be "detected" as explained above.

Also, the pilot valve of Figs. 1 and 4 could not work if the pressure in the second chamber, acting on smaller diaphragm S_1, was not the downstream pressure 3, but a completely independent pressure source. In the latter case, the control pressure P would be acting against an independent pressure source on the other side of both diaphragms S_1 and 7 (because in the device of FR 1,582,851 these are directly linked by passage 3), so the main valve would not open in the event of a drop in the downstream pressure, because this would not be detected by its acting on the other side of these diaphragms.

Therefore, the teaching of either Bradshaw or Konieczynski or Eidsmore cannot be applied to the pilot valve in Figs. 1 and 4 of FR 1,582,851 because the latter document teaches against the use of such independent control pressure sources, since the pilot valve of this document must be used in a closed system: it could not function if either pressure p (downstream) or P (control chamber) had a completely independent source, which was not derived from either the outlet or inlet pressure.

French patent 1,582,851 teaches against the use of an independent control pressure.

The Bradshaw, Konieczynski and Eidsmore references each describe independent control pressure sources which act *directly* upon the *principal* regulator (i.e. the vacuum regulator of Bradshaw, the pressure regulator of Eidsmore and the liquid dispenser of Konieczynski). There is no teaching in either Bradshaw, Konieczynski or Eidsmore that the independent control pressure source could in any way be suitably applied to the *pilot* valve of a *closed* system such as that of FR 1,582,851.

Therefore, if any of the independent control pressure sources of these documents were to be applied to the system of Figs. 1 and 4 of FR 1,582,851, the entire pilot valve (1) of FR 1,582,851 would have to be removed and replaced by a completely independent control pressure source acting on the principal diaphragm 7, in order to control the principal control valve 8. Of course, such a system does not fall within the claims of the present invention.

Moreover, even if such an independent pressure source were connected to the second chamber, above the diaphragm S_1, of the pilot valve of FR 1,582,851 (Fig. 1), it would still be in fluid communication with the control chamber 111, via intermediate chamber 6. Chamber 6 has a fluid connection to this second chamber of the pilot valve, as well as to the control chamber 111. Again, such a system would not fall within the present claims, which specify that the second chamber is neither in fluid communication with said control chamber nor with the pressure reducing valve being controlled.

Therefore, the independent control pressure sources described in Bradshaw, Konieczynski and Eidsmore cannot physically be incorporated into the system of Figs. 1 and 4 of FR 1,582,851 to arrive at the presently claimed pilot valve.

The purpose of the improvements taught by FR 1,582,851 is to have the areas of the diaphragms as close as possible to each other to improve the gain of the pressure control system (and therefore the control quality), and to have a throttle arrangement 21 (Figs. 2 and 5). These features help compensate for variation in outlet pressure due to changes in the inlet pressure.

Therefore, FR 1,582,851 neither teaches nor suggests that the system could be modified or improved by connecting the pilot valve itself to a completely independent pressure source. Any improvements

taught by FR 1,582,851 do not involve deviation from a closed system as shown generally in Fig. 1. Both the "conventional" system of Figs. 1 and 4, and the "improved" system of Figs. 2 and 5, are completely closed (see page 2, line 6), with an overall layout similar to that described in Fig. 1.

The pilot valve of FR 1,582,851 is for a closed gas regulator system, in which the pressure *being* controlled is "p", acting on the smaller diaphragm S_1 in the second chamber, and the *control* pressure is "P", in the control chamber 111, which is controlling the outlet pressure of the principal valve 8.

This is in contrast to the present invention, in which the reverse is true: the pressure *being* controlled is that in the control chamber, whereas the *control* pressure is the pressure source applied to the second chamber. An advantage of this arrangement is that the control pressure can be from a completely independent source, so that the present invention enables a relatively small air pressure, for example, to effect a relatively large change in water pressure. Such an advantage is not possible using the "opposite" arrangement described in FR 1,582,851, in which the control pressure is internally generated in chambers 111 and 6. Therefore an independent control pressure source is not required or taught by FR 1,582,851.

Furthermore, the advantage of the present invention of enabling an independent gaseous control pressure to control a main water valve could not be realised in the system of FR 1,582,851, because the control pressure of FR 1,582,851 is in fluid communication with both the inlet pressure 5 and also the outlet pressure 3 (via intermediate chamber 6 and the second chamber of the pilot valve). In the pilot valve of the present invention it is clear that the control pressure applied to the pilot valve, such as air, cannot meet with the controlled water pressure.

Therefore, FR 1,582,851 teaches against the advantageous features of the presently claimed

pilot valve, such as (i) having an outlet connectable so that water pressure at the outlet is substantially equal to the outlet pressure of the pressure reducing valve being controlled; (ii) the control pressure being different from the outlet pressure of the pressure reducing valve being controlled; and (iii) the second chamber being neither in fluid communication with the control chamber nor with the pressure reducing valve being controlled. The valve of FR 1,582,851 could not be obviously modified to be operable in this way, and especially not in the light of Bradshaw, Konieczynski or Eidsmore.

It could not have been obvious to use an independent pressure source, such as that illustrated by the three cited US Patent documents, Bradshaw, Konieczynski and Eidsmore, in a "reverse acting", "failsafe" pilot valve such as that in FR 1,582,851, in which an increase in the outlet pressure applied to the second chamber decreases the flow through the pilot valve control chamber, so that if the pressure applied to the second chamber dropped, there would be *increased* flow through the control chamber. Indeed, the system of FR 1,582,851 has this "reverse acting" purpose of compensating for variations in the outlet pressure due to variations in the inlet pressure, and the pressure applied to the second chamber is directly linked to the outlet pressure.

Conversely, none of the three US Patent documents, Bradshaw, Konieczynski and Eidsmore, describe "reverse acting" systems, and it is not the case that if the control pressure of any of these systems fails, the valve opens wider and the flow through it is maximised. On the contrary, in the vacuum regulator of Bradshaw, a predetermined pressure in the regulator is provided by a given control pressure input from an auxiliary air pump (col. 2, lines 57 to 59). Therefore, if the air pump of Bradshaw failed, the predetermined pressure would not be maintained. Similarly, if the control pressures applied to the valves of Konieczynski and Eidsmore failed, these valves would close and

the systems would be inoperable.

Clearly, the prior art documents Bradshaw, Konieczynski and Eidsmore use an independent control pressure source merely to maintain a main valve in an *open* position, and are not "failsafe" or "compensatory" in the event of a drop in this pressure. This is contrary to the purpose of the outlet pressure 3, or p, applied to the second chamber and diaphragm S_1 of the reverse acting pilot valve of FR 1,582,851. Thus, the latter document teaches against using the independent control pressure sources of Bradshaw, Konieczynski and Eidsmore, which would effectively render useless the pilot valve of FR 1,582,851.

It is believed that the application is now in condition for allowance and such action is earnestly solicited. If any further issues remain, a telephone conference with the Examiner is requested.

Respectfully Submitted

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